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## NATURAL HISTORY OF THE HISS.

BY LOUIS ROBINSON, M. D.

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ONE of the most alluring and elusive problems which tantalize the student of evolution is the cause of the rise of the Mammalia from the reptilian world of the Secondary Epoch. We have no sufficing knowledge of the factors of environment to justify us in propounding a dogma ; but it is evident, from the remains of the earliest warm-blooded animals which have come to light, that they were a feeble and underling race. Air, earth and water swarmed with devouring foes. The only chance for the weak lay in concealment, or in an agility of limbs and wits surpassing that of their pursuers. Now, continued muscular activity involves great chemical changes in the tissues ; hence the necessity of a rapid circulation of the blood and means for its efficient purification. Some cold-blooded air-breathers are capable of extremely quick movements, but none can keep them up for long together. The creatures in which the blood was more perfectly aerated were better adapted for the rapid emergencies of life than the others, and consequently those which had ample lungs and a four-chambered heart would save themselves in life's running battle when the older type failed.

Most interesting is it to look back to the constant dividing of the ways which have led us and our fellow inhabitants of the earth to such different existences. It would seem that at that critical epoch it was a query whether activity or sluggish concealment would give the weaklings the best chance of survival. The race is not run to the finish, for in life's handicap the final heat is indefinitely postponed ; but if you want to estimate the relative progress on the diverse tracks, take note of the most perfect woman of your acquaintance and of the mottled toad which dwells in your garden. Let all Tories digest this hint of the final outcome of their principles.

It is a truism of history that a struggling race develops quali-

ties which enable it in the end to conquer. The thieving goat-herds of Latium, perpetually at strife with the folk on the far side of the next hill or rivulet, after long ages of conflict evolved a force and valor which subdued the world. The sparse clansmen of the Highlands, for centuries at one another's throats about matters which a county court judge would settle in a couple of minutes, now wield an influence over civilization entirely out of proportion to their numbers. The Jews, trampled in the mud of the Ghetto, and gasping for bare existence throughout the dark ages, hold the key of the treasury of the Eastern hemisphere.

It is only through great tribulation that we enter into any kingdom, whether earthly or heavenly. The remote history of our own race fades back into darkness which neither legend nor philology does much to illumine. But this law teaches us that the indomitable vitality of the Anglo-Saxon peoples is a sure index of a prolonged and desperate grapple with adversity on the part of our early forefathers, which, though not recorded in words, has left its impress forever on the fibre of our minds and muscles.

But to return again to the earlier mammals. They undoubtedly came of a cold-blooded preexisting stock, and were evolved in a reptilian environment. Not only their derivation (as comparative structural anatomy proves) but also the obstetric agencies involved in their initiation into being, have left an indelible birthmark upon all warm-blooded creatures. The war between the newer and older orders was "to the knife," and was continued throughout whole geologic epochs so vast that it is futile to try to reckon them by our standards of time. No wonder that the trail of the reptile is across all nature, from the instincts of the hog to the devotions of the saint! We probably owe more to this coercive spurring from below than it would suit our dignity to admit. Yet, when we come to think of it, Nature is alive with instances of the development of what are deemed noble attributes through the humiliating impetus of a *vis a tergo*. There can be no doubt that the speed and endurance of the horse is directly traceable to the fact that, for countless generations before he came under human influence, he had to flee for his life from the wolves of his native steppes. And in like manner many qualities which have helped our species to its present supremacy may have had their origin in the dire exigencies of that pristine war. Our passions, our affections, our aspirations—

the very spires and pinnacles of our moral nature—rest on mundane foundations as ancient as the Mesozoic rocks.

It may take a little of the bounce out of our inflated and pachydermatous conceit to be reminded that, if we are nearer the goal than formerly, it is because we have been well kicked by a team of urgent circumstances ever since the ball of life was first set rolling.

The whole subject of reptilian residual influences is so vast and obscure that it will be well for present purposes to leave the enticing twilight of speculation for a while and to examine a few facts that may serve to illustrate the theories put forward. For this purpose some particulars concerning the impress left on birds and mammals by the contest with snakes (the most successful warriors of the reptilian host) will, I hope, prove both useful and interesting, especially as some of the observations have never before been recorded.

Let us take as a starting point the strange instinctive terror of the serpent which nearly all animals exhibit. It is not the result of individual experience, for experience, after receiving the venom of a cobra or a fer-de-lance, may be deemed a negligible quantity. It is inherent and is as much a part of the organism as the skeleton or the desire for food. Its universal distribution asserts its extreme antiquity.

Into the origin of the terrible perfection of the snake we cannot here enter. He is one of Nature's triumphs of specialism, and he had progressed along his narrow ophidian groove of development for millions of generations before even the most primitive mammal came into existence. It is evident that he himself must have been at one time hard beset by the stress of hostile environment to have evolved such a unique efficiency of fang and coil. Yet the very supremacy he has won in his own line of life has spoiled his chance of higher adaptive progress. The shifts to which the more defenceless and versatile beings have been put to dodge imminent destruction (and which have resulted in such startling consequences as the human intellect), his lithe agility and his fearful armature enabled him to eschew with disdain. He now inherits the lot of a narrow and militant conservatism in a progressive age. On his belly shall he go and dust shall he eat all the days of his life.

It seems probable that the feeling of shuddering repulsion we

have for all cold and crawling things is part of our share of this inherited instinct, which is itself an echo of the ancient feud. A man who was constantly handling snakes told me that although he had no fear of them, yet he experienced a thrill of intense aversion whenever he placed his hand on one. His rational mind had concluded a peace with the Ophidia, but his more animal and primitive nervous system had not, and had to be coerced into an outward acceptance of the treaty. One notices even among the birds and beasts which destroy serpents a kind of exaggerated excitement when they are in the presence of one which they do not display when they attack other kinds of quarry.

Among our kinsmen the apes the dread of snakes is universal ; and is as much exhibited by those bred in captivity as in those freshly caught. The other day I transformed a savage old male *rhesus macacus* which was tearing at his cage to get at me, with crimson face and gnashing canines, into a limp and pallid coward by the exhibition of a Japanese toy snake which I had in my pocket. Practical naturalists who have to do with strong and fierce monkeys occasionally resort to a similar stratagem in order to intimidate them. Mr. Rudyard Kipling introduces this fact into one of his tales, and makes the caretaker of an orang-outan, on board ship, gently hiss like a serpent whenever his charge became too obstreperous. I have tried the same experiment with apes of various kinds, and invariably with immediate results. The suddenly arrested movements and startled timorous look at once betrayed how much the mind of the beast was agitated by that uncanny sound.

Is it not strange that, throughout all nature, from the desolate swamp to the opera-house radiant with electric light, a hiss is an imitation of hostile intent ? And that it invariably sends a flutter of apprehension through the nerves of the hearer ? An actor who was great in the part of the ultra-villain in melodrama said that he never heard the hisses with which the gallery applauded his quasi-turpitude, without an uncomfortable momentary shudder, although he well knew that the sound was meant as an expression of the most sincere appreciation of his talents.

Does not the novelist make his arch-reprobate hiss his curses when his demoniac emotion is too intense for shouting ? Is it not possible that political audiences are unconsciously guided by a deeply-seated animal instinct when they greet the unpopular

orator or sentiment with a storm of sibilation? Of course the speaker or actor knows quite well that the auditorium is not (except metaphorically) a nest of serpents, just as the keeper of the reptiles at the zoölogical gardens knows that a harmless snake will not kill him when he handles it; but the disconcerting *aura* comes all the same, and the hiss generally serves its purpose. I have taken pains to let a monkey see that my toy snake was only made of paper, yet the next time it appeared from my pocket he sprang back involuntarily just as at first. Darwin states that although he knew that a sheet of thick plate glass was between him and an enraged cobra, he could not help jerking his head back every time it darted towards him.

Why does a snake hiss? It has been suggested that the sound is at times caused by the rapid expulsion of the air from the long bladder-like lung at the moment of attack, so that the reptile may be enabled to dart with greater rapidity, "like a cast lance," upon his enemy. If so, it was at first a plain, though quite involuntary intimation to his adversary that he was "just going to begin", and gradually came to be a threat; just as the taking off the coat is deemed a proper demonstration of intention among pugnacious boys when provocation has reached a certain pitch.

I hope at some time, if professional work permits, to complete an essay on the sounds uttered by animals (and men) in expressing their various emotions, and to trace these back to their basis in Nature. In this article it will not be possible to attempt a more detailed analysis.

What other evidence have we that the hiss among warm-blooded animals has an ophidian origin? Is it not an instructive and significant fact that in *all departments of the animal kingdom* creatures which make their homes and rear their young in hollow trees and such-like places make a hissing noise when one attempts to explore their strongholds? Owls, tits, bats, some woodpeckers, marsupial phalangers and dasyures, opossums, cats, and many others not connected by appreciable blood relationship, have this curious habit. Every widely-spread instinct or attribute such as this is of the most intense interest to naturalists, for it is in itself sure evidence of some far-reaching evolutionary influence.

One can easily understand that a prowling carnivore which anticipated the presence of something edible in a hole would con-

sider twice before inserting a "privy paw" when he heard that blood-curdling threat. If his muddle-headed intelligence enabled him to weigh the *pros* and *cons* of the dilemma (which is improbable), he might argue somewhat in this way: "There may be a dinner up yonder, but then again there may be sudden death. It smells like kittens, but it sounds devilishly like a snake. This investment is too risky for a beast with a wife and half a dozen cubs. I will try another hole."

Dame Nature is a most excellent economist. She allows nothing to go to waste. If impetuous evolutionary agencies produce an inch of stuff more than is required for the immediate purpose, it is at once pounced upon and utilized in another part of the establishment. Does a butterfly develop a nauseous flavor, so that the gizzards of insectivorous birds turn queasy at the very sight of it? Other and sapid butterflies, in the same district, mimic its shape and color; and, thus disguised, secure immunity from attack. Does a bird prove himself a tough antagonist so that his enemies gladly leave him alone? Other birds, especially feeble ones like those of the cuckoo family, imitate his shape, plumage, and manner of flight.

It is a queer household that the old Dame rules with so wide an eye to the main chance and such Martha-like solicitude as to petty details! Her children are as virginally unconscious of design as the snowflakes; yet their days and nights are spent in all the bizarre disguises of a *bal masqué* with more than a suspicion of a basis of sordid intrigue.

It would indeed be a matter for surprise if so frugal a housewife as Nature allowed the wide-spread fear of the snake to remain a waste product. So called Protective Mimicry is considered rare among the higher vertebrates. I am inclined to think that closer observation will show that it is commoner than naturalists imagine. Let us consider a few particulars about the one animal which is familiar to us all, from among the list of those that breed in dark holes, to wit, the cat. They are scarcely conclusive enough to form a working theory upon, but at the same time they are very suggestive.

Several observers have remarked that the head of an enraged cat, with its flattened triangular outline, its exposed teeth and obliterated ears, and its glinting eyes with their slit-like pupils narrowed to a mere line, has a strikingly viperine appearance.

Its hiss—short explosive bursts or longer harsh expirations—is exactly like the sound vented by certain snakes when about to strike. It faces its adversary, and behind its fore-shortened body, waves the mottled tail in quick sinuous curves—utterly unlike the wagging of the tail of a dog—in precisely the same manner as that in which the hinder ends of all snakes move when they are excited. The enemy, probably one of the *canidæ*, which are all timid of serpents, might know that it was a non-poisonous mammal all the time, and yet the dreadful *suggestio falsi* might easily disconcert him just enough to shake his self-confidence and to give the cat the advantage.

Nor is this all. The true tabby cats (those with wide black markings) have, in nine cases out of ten, the stripes so arranged that when they are curled up asleep they present exactly the same appearance of a coiled serpent. My wife's favorite cat—"Gwendolen," a very handsome half-bred Persian, first drew my attention to this fact as she lay on the hearth rug in my study. On the flank is an oval dark mark, which forms the centre of the concentric rings, and which might easily be mistaken for a snake's head as it lay coiled for a spring.

Since my attention was thus drawn to the subject I have observed many tabbies, and find that in nearly all those of this type the markings have the same distribution. On looking further into the matter I found that in several very noteworthy instances the markings of cats from various parts of the world almost exactly corresponded in *width, color and pattern*, to the markings of the formidable snakes of the country they inhabit. This is remarkably so in the case of the smaller ocelots, which are covered with r'band-like bands that might almost have been printed on a tawny background from the mottled skin of a *crotalus*. The larger cats of the same family, including the jaguar, have variegated curved marks on them resembling those of the South American boa-constrictor. These mottled bands are so arranged that when the animals are asleep, in the usual attitude of the *felidæ*, they form concentric curves, either circular or oval.

Now I am willing to admit that all this may be mere coincidence, and certainly the jaguar (although he is only a bloated ocelot) does not seem in need of any special protective coloring. It is difficult also to see what kind of danger menaced the slumbering cats which could be warded off by a serpentine aspect. Still,

taken with other facts, and considering the possible lapse of time and change of environment since the fashion of wearing a snake pattern commenced, the resemblances appear to merit further attention.

In some other departments of natural history there can be scarcely any doubt that an actual mimicry of the snake has been resorted to on account of the immunity it afforded. Nearly all long-necked birds, especially those which nest in the sedge or jungle, will hiss and dart out their sinuous necks in a very snake-like way when an intruder approaches. This may be observed in any duck or goose which is sitting, although the habit is, I believe, rare among birds which breed in Arctic regions. Travellers in the pampas have been unpleasantly startled by the realistic acting of the brooding rhea when he thus assumed the reptilian rôle to intimidate a trespasser who approached too near the family nest. Here again the foes to be warned off are chiefly of the fox and wolf tribe; but the cats, in spite of their own ophidian strategy, are not proof against the terror inspired by the snake.

It has often struck me as a curious instance of the indelible character of inherited instincts that the domestic hogs imported into America (and which are of mixed European and Chinese stock) should at once assume the offensive against the rattlesnakes and other formidable reptiles of the New World, with an address and a system of attack which show that this kind of warfare was familiar to them. This instance serves to prove to us that the impressions received by the nervous organism countless generations ago remain an important factor in modern life. It is akin to those *vestigial reflexes* to which I have repeatedly alluded to in my papers on ancestral traits in infants (published last year in England and Germany), which, I understand, have attracted nearly as much attention in the United States as in Europe. Among the experiments which I tried in the course of those investigations were some in which I endeavored to ascertain how far the intense instinctive horror of the serpent shown by the Quadrupeds was exhibited by very young children. The results were interesting and suggestive, but I have not, as yet, considered them conclusive enough for publication.

Did space permit, many other instances could be brought forward of the profound influence of such instincts throughout all

departments of life. Can we doubt that the part played by dragons and snakes in superstitions and primitive philosophies, all the world over, is traceable to such a cause? We must recollect that in former times,—and in those not far beyond the margin of history,—the reptilian inhabitants of the earth were far more numerous and formidable than they are to-day, and took a much larger and more sinister place in the every-day life of men and beasts.

It is a suggestive fact, to say the least of it, that in the version of the legendary Human Drama upon which our Western ideas are so largely founded, the Evil Principle makes his first appearance as "The Serpent."

LOUIS ROBINSON.